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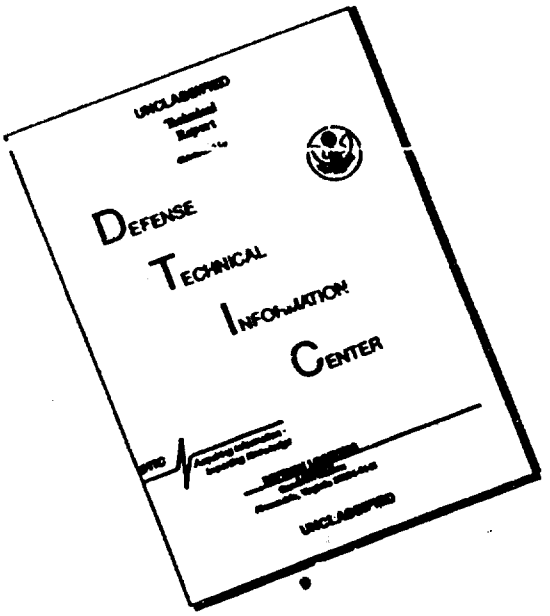

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In order to maintain the educational aspects of these monthly cases, the abstracts and titles will be presented following the Summary section each month.

Case #33 was prepared by TERENCE J. LYONS, M.D., M.P.H., and MARC S. KATCHEN, M.D.

USAFSAM/EDK, Brooks Air Force Base, Texas

Part I—Initial Clinical Presentation

A 30-year-old male pilot assigned to a base in West Germany was involved in an accident while the sole occupant of a motor vehicle. There were no witnesses to the accident, but he evidently lost control of his car on a wet, tortuous road, and rolled his car over. He was able to walk 0.25 mi to his home. His wife, observing him to be disoriented, and with a cut on his head and an injured right arm, brought him immediately to the emergency room.

When seen by the physician in the emergency room, he was still disoriented. He responded appropriately to questions, but was unable to remember the events preceding or following his injury. He complained of neck and shoulder pain. He had no past medical history of neurologic problems or febrile convulsions. He gave no family history of epilepsy. He was a moderate social drinker, restricting his alcohol intake to beer and wine on weekends. The examination revealed a 2-cm laceration of his right parietal area and a slight elevation of the distal right clavicle. The radiographs confirmed a right acromioclavicular subluxation. Additional X-rays of the skull and cervical spine were normal, as was a computed tomographic (CT) scan of his head and neck. The patient was initially managed by an orthopedic surgeon. When seen by the flight surgeon the next morning, the patient was alert, oriented, and neurologically normal.

Question 1: From an aeromedical viewpoint, what are the clinical sequelae of concern?

Question 2: What features of the clinical presentation should be more accurately defined to permit proper aeromedical disposition?

Part II—Results of Further Examination

The increased incidence of post-traumatic seizures following head trauma increases with the severity of the head trauma. Both the length of unconsciousness and duration of amnesia are related to the risk of subsequent post-traumatic amnesia. Proper aeromedical disposition depends on accurate estimates of length of unconsciousness and duration of amnesia. These estimates should be determined while the details are still fresh in the mind of both the patient and witnesses.

Our pilot had spent the evening of the accident at home with his wife and a friend. During the evening he had consumed two beers. At about 11 o'clock in the evening he drove his friend home. Approximately 50 min later he returned home on foot. We estimated total driving time to have been about 20 min. Allowing about 10 min for the pilot to walk home, we concluded that the total time of unconsciousness would not have exceeded about 20 min.

The history was obtained entirely from the wife since the pilot remained unable to recall the events during the 2 h preceding his accident. He was initially unable to fully remember the events through the next morning. But his recall continued to improve, so that by the end of his 4th day of hospital stay he had continuous memory of the events beginning with being awakened by nurses for neurologic status checks in the early morning of the day of admission. He was never able to continuously recall the events of his evaluation in the emergency room or his initial evaluations on the ward. We estimated that he experienced about 2 h of retrograde amnesia and 4 h of anterograde amnesia.

Complete evaluation before consideration for a waiver for moderate head trauma includes a neurologic examination, a computed tomographic (CT) scan, and neuropsychological tests. An electroencephalogram (EEG) is *not* indicated in the initial management of head trauma, as it will be predictably abnormal in the acutely head-injured patient. In the past it was recommended that an EEG and a sleep-deprived EEG be obtained in the post-recovery phase to exclude epileptiform discharges (10). The flight surgeon should be aware, however, that the EEG is neither a sensitive nor a specific predictor of post-traumatic epilepsy (PTE) and is no longer routinely required by U.S. Air Force regulations in the evaluation of the head-injured pilot.

Question 3: What is this pilot's risk for sudden incapacitation in the future?

Question 4: How will this risk change over time?

Part III—Risks of Post-Traumatic Sequelae

Seizures have long been recognized as a potential complication of head trauma. Risk factors for late PTE include a history of complex febrile convulsions, a family history of epilepsy, an intracranial hematoma, a depressed skull fracture, and the occurrence of seizures in the immediate post-injury period. The duration of loss of consciousness and of post-traumatic amnesia have also been correlated with the risk of PTE (1,7,8). The likelihood of first developing PTE appears to decline in a predictable manner with time. Over 60% of PTE will occur within 1 year of injury, and approximately 85% within 2 years (5,8).

Predicting the risk of PTE in mildly and moderately head-injured patients has been controversial. Most epidemiologic studies of PTE have been confined to high risk populations such as wartime casualties, or patients referred to neurosurgical centers (3,4,7,9,11,12). Annegers *et al.* (1), in 1980, studied all head-injured patients who had come to medical attention (inpatient or outpatient) over a 40-year period in Olmstead County, MN. This is the only controlled, population-based study available for evaluating the risks of PTE (3). This study demonstrated a cumulative risk of PTE in only moderately injured patients (more than 30 min but less than 24 h of unconsciousness and/or post-traumatic amnesia with no other risk factors) of 1.6% over the first 5 years post-injury ($p < 0.05$). The risk in the mildly injured patients (less than 30 min of unconsciousness and/or post-traumatic amnesia) was 0.6% (relative risk = 1.5, 95% confidence interval 0.6 to 3.3) (1).

Question 5: When would you consider returning this pilot to flying status?

Part IV—Aeromedical Disposition

Aeromedical standards change as our understanding of disease epidemiology in healthy, asymptomatic populations improves. Head injury is one entity for which U.S. Air Force policy on aeromedical disposition has become more strict in the past decade. The moderately head-injured patient is recognized as being at increased risk of post-traumatic epilepsy for a prolonged period of time following injury. Standards up until 1985 allowed a pilot with loss of consciousness of up to 2 h and post-traumatic sequelae of up to 48 h to be returned to flying after only 3 months of observation if complete neurologic examination, an EEG, and a sleep deprived EEG were normal. Recognizing, however, that an injury severe enough to cause amnesia implied the same internal disruption as an injury which causes loss of consciousness (6), the U.S. Air Force subsequently adopted a head injury classification schema identical to that used by the Annegers *et al.* study (1). Current standards require any combination of loss of consciousness or amnesia lasting longer than 30 min and less than 24 h to be disqualifying for at least 2 years.

More sensitive clinical tools to determine subgroups at increased risk of PTE are needed. Some investigators have suggested that the CT scan may provide such a tool by detecting parenchymal damage in the immediate post-injury period (2).

For now, prevention of such injuries in aviators remains the only satisfactory approach. Flight surgeons should stress to their pilots that their occupation makes unique demands on their health behavior. Individual risk-taking in off-duty activities, such as driving, motorcycle riding, or contact sports, can have serious consequences for a flying career. Motor vehicle accidents are, of course, a major cause of both injury and death among our military forces, especially in unfamiliar overseas driving environments. Flight surgeons should take an active role in base safety and accident prevention efforts.

Fortunately the pilot presented in this case report did not develop any further post-traumatic sequelae and was returned to flying duties 24 months following his initial injury.

Abstract

LYONS TJ, KATCHEN MS. Case from the Aerospace Medicine Residents' Teaching File #33: An aviator with head trauma and post-traumatic amnesia. The risk of post-traumatic epilepsy and aeromedical disposition are discussed.

REFERENCES

1. Annegers JF, Grabow JD, Groover RV, Laws ER, Elveback LR, Kurland LT. Seizures after head trauma: a population study. Neurology 1980; 30:683–9.
2. D'Alessandro R, Ferrara R, Cortelli P, Tinuper P, Pazzaglia P, Lugaresi E, Servadel F. Posttraumatic epilepsy prediction and prophylaxis: open problems. Arch. Neurol. 1983; 40:831.
3. Deymeer F, Leviton A. Posttraumatic seizures: an assessment of the epidemiologic literature. Cent. Nerv. Syst. Trauma 1985; 2: 33–43.
4. Evans JH. Post-traumatic epilepsy. Neurology. 1962; 12:665–74.
5. Feeney DM, Walker AE. The Prediction of posttraumatic epilepsy: a mathematical approach. Arch. Neurol. 1979; 36:8–12.
6. Firth JL. Return to flying after head injuries: a review. Aviat. Space Environ. Med. 1983; 54:603–8.
7. Jennett WB, Lewin W. Traumatic epilepsy after closed head injuries. J. Neurol. Neurosurg. Psychiat. 1960; 23:295–301.
8. Moore HJ. Disposition of aviators following head trauma. Soc. U.S. Naval Flight Surgeons Newsl. 1985; Vol.IX:No.1.
9. Penfield W, Shaver M. The incidence of traumatic epilepsy and headache after head-injury in civil practice. Res. Publ. Assoc. Res. Nerv. Ment. Dis. 1945; 24:620–34.
10. Randel HW, ed. Aerospace medicine. 2nd ed. Baltimore: Williams and Wilkins Co., 1971.
11. Robotham GF. The long-term results of injuries of the head. J. Ment. Sci. 1949; 95:336–54.
12. Weiss GH, Feeney DM, Caveness WF, Dillon D, Kistler JP, Mohr JP, Rish BL. Prognostic factors for the occurrence of posttraumatic epilepsy. Arch. Neurol. 1983; 40:7–10.